IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appl. No. : 10/509,409
Appellant(s) : HOELEN, Christoph G. A., et al.
Filed : 23 September 2004
Title : COMPACT LIGHTING SYSTEM AND DISPLAY DEVICE

TC/A.U. : 2875

Examiner : LEE, Y My Quach

Atty. Docket : NL 0020264

APPELLANT'S APPEAL BRIEF

Board of Patent Appeals and Interferences
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Brief of Appellant follows a Notice of Appeal dated 12 October 2006, appealing the Final rejection of the Examiner dated 26 July 2006, as modified by the Advisory Action of the Examiner dated 5 October, 2006, finally rejecting claims 1-3, 7-9 and 13-16 of the application.

All requisite fees set forth in 37 CFR 1.17(c) for this Brief are hereby authorized to be charged to Deposit Account No. 14-1270.

REAL PARTY IN INTEREST

The real party in interest in this appeal is the assignee of all rights in and to the subject application, Koninklijke Philips Electronics, N.V. of The Netherlands.

RELATED APPEALS AND INTERFERENCES

To the best of the knowledge of the undersigned, no other appeals or interferences are known to Appellants, Appellants' legal representatives, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

Of the original claims 1-16, claims 4, 7, 9, 10, 13 and 15 were preliminarily amended to delete multiple dependencies, claims 1-3 and 6-14 were amended to improve their form, claims 4-6 were cancelled and claims 17-20 were added as new claims. Claims 1-3 and 7-20 remain in the application. Claims 1-3, 7-9 and 13-16 now stand finally rejected as set forth in the Final Office Action dated 26 July 2006, as modified by the Advisory Action dated 5 October, 2006, and are the subject of this appeal.

STATUS OF AMENDMENTS

Claim 6 was cancelled in response to the Final Office action. All amendments have been entered.

SUMMARY OF THE CLAIMED SUBJECT MATTER

The invention relates to a lighting system provided with a light-emitting panel comprising

- a front wall, a rear wall situated opposite thereto, and furthermore, between the front and the rear wall, a first edge surface and, opposite thereto, a second edge surface,

- the first edge surface being light-transmitting,

- while at least a first light source is associated with the first edge surface, and

- while, in operation, light originating from the first light source is incident on the first edge surface and distributes itself in the panel. **(page 1, lines 1-8)**

The invention also relates to a display device provided with said lighting system. **(page 1, lines 9 and 10)**

In a first aspect of the invention, a lighting system is provided with a light-emitting panel which includes:

a front wall, a rear wall situated opposite thereto, and opposite first and second edge surfaces between the front and rear walls,

the first edge surface being light-transmitting,

at least a first light source associated with the first edge surface, light originating from the first light source being incident on the first edge surface and distributed in the panel,

wherein the light-emitting panel widens over a widening section from the first edge surface in a direction towards the second edge surface, and

wherein the rear wall is provided over the widening section with a multiplicity of steps of which a surface facing the front wall is substantially parallel to the front wall, and

wherein the surface or a material covering the surface of the second edge surface is specularly or diffusely reflecting. **(claim 1; page 2, lines 27-31; page 5, lines 3-5; figs. 1, 4 and 5)**

In accordance with a preferred embodiment of the first aspect of the invention, the ratio of the surface area S_1 of the first edge surface and the largest cross section S_{1cs} in the light-emitting panel substantially parallel to the first edge surface satisfies the relation:

$$1 < \frac{S_{lcs}}{S_1} < 10 .$$

(claim 2; page 4, lines 3-7)

Preferably, the ratio S_{1cs}/S_1 satisfies the relation:

$$1.5 < \frac{S_{lcs}}{S_1} < 3 .$$

(claim 3, page 4, line 21)

According to another preferred embodiment of the first aspect of the invention, a surface of the steps makes an angle β with respect to a normal on the front wall, wherein $-48 \leq \beta \leq 48°$. **(claim 7; page 6, lines 8-10)**

Preferably, the angle β is in the range $0 \leq \beta \leq 48°$. **(claim 8, page 6, lines 19 and 20)**

The front wall of the light-emitting panel may be provided with a translucent diffuser. **(claim 9; page 15, lines 3 and 4; figs. 1, 4 and 5)**

In another embodiment of this aspect of the invention, the light source comprises one white LED or at least

two light-emitting diodes with different light emission wavelengths. **(claim 13; page 7, lines 2-5; figs. 1, 2, 4 and 5)**

In a second aspect of the invention, a display device is provided with the lighting system as claimed in claim 1. **(claim 15; page 8, lines 21 and 22; figs. 1, 2, 4 and 5)**

In an embodiment of the second aspect of the invention, the display device comprises a liquid crystal display. **(claim 16; page 10, line 20; figs. 1 and 2)**

GROUND(S) OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to be reviewed on appeal are:

1. Claims 1-3, 7, 8, 13, 15 and 16 are finally rejected under 35 USC 102(e) as being anticipated by Gotoh et al. published US patent application 2003/0137821 (herein 'Gotoh'); and

2. Claims 9 and 14 are finally rejected under 35 USC 103(a) over Gotoh in view of Lammers US patent 6,672,734.

ARGUMENT

1. Are Claims 1-3, 7, 8, 13, 15 and 16 anticipated under 35 USC 102(e) by Gotoh?

Regarding claim 1, Gotoh neither teaches nor suggests that the surface of the second edge surface is specularly or diffusely reflecting or is provided with a specularly or diffusely reflecting material, as called for by claim 1.

In response to Appellant's argument that Gotoh neither teaches nor suggests that the second edge surface is specularly or diffusely reflecting, the Examiner has stated that Gotoh's surface 14 is highly reflecting, which meets the definition of specularly reflecting, citing para. [0050], lines 1, 2 and 9-11 of the reference.

However, Appellant claims a specularly or diffusely reflecting surface.

Reflection of light may be specular (that is, mirror-like) or diffuse (that is, not retaining the image, only the energy) depending on the nature of the interface.... A mirror provides the most common model for specular light reflection....The *law of reflection* states that $\theta_i = \theta_r$, or in other words, the angle of incidence equals the angle of reflection.
http://en.wikipedia.org/wiki/Reflection %28physics%29#Specular .28mirror-like.29 reflection

When light strikes a specularly reflecting surface, the angle of incidence equals the angle of reflection.

When light strikes a rough or granular surface, it bounces off in all directions due to the microscopic irregularities of the interface. Thus, an image is not formed. This is called *diffuse reflection*. The exact form of the reflection depends on the structure of the surface.
http://en.wikipedia.org/wiki/Reflection %28physics%29#Specular .28mirror-like.29 reflection

Gotoh nowhere mentions or even hints that surface 14 is either specularly or diffusely reflecting. Gotoh merely states that surface 14 is 'highly reflecting'. This could mean that surface 14 is specularly reflecting, or it could mean merely that surface 14 is diffusely reflecting, but 'highly reflecting' compared to other diffusely reflecting surfaces.

This ambiguous disclosure is insufficient to anticipate claim 1, since:

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Since Gotoh fails to disclose all of the elements of claim 1, it does not anticipate claim 1.

Regarding claim 2, Gotoh does not disclose that the ratio S_{lcs}/S_l of the surface area S_l of the first edge surface and the largest cross section S_{lcs} in the light-emitting panel substantially parallel to the first edge surface satisfies the relation:

$$1 < \frac{S_{lcs}}{S_l} < 10 .$$

Regarding claim 3, Gotoh does not disclose that the ratio S_{lcs}/S_l satisfies the relation:

$$1.5 < \frac{S_{lcs}}{S_l} < 3 .$$

Regarding claim 7, Gotoh does not disclose that a surface of the steps makes an angle β with respect to a normal on the front wall, wherein $-48 \leq \beta \leq 48°$.

Regarding claim 8, Gotoh does not disclose that a surface of the steps makes an angle β in the range $0 \leq \beta \leq 48°$.

Regarding claims 13, 15 and 16, without conceding their patentability per se, these claims are nevertheless patentable by virtue of their direct or indirect dependency on claim 1.

Accordingly, claims 1-3, 7, 8, 13, 15 and 16 are not anticipated by Gotoh, and the rejection is in error and should be reversed.

2. Are claims 9 and 14 unpatentable under 35 USC 103(a) over Gotoh in view of Lammers?

Regarding claim 9, Lammers discloses an illumination system and display device which includes a diffuser (28) positioned between the backlight (1) and the LCD panel (34). The diffuser (28) is described as a polarizing diffuser. See col. 7, line 55. Nowhere does Lammers describe filter (28) as a translucent diffuser, nor does Lammers suggest that a translucent diffuser could be substituted for the polarizing diffuser disclosed. Likewise, Gotoh does not teach or suggest a translucent diffuser.

While not conceding the patentability per se of claim 14, it is pointed out that claim 14 is patentable by virtue of its dependency on claim 1 through claim 13, for the reasons already advanced with respect to claim 1.

Accordingly, the rejection of claims 9 and 14 over Gotoh in view of Lammers is in error and should be reversed.

CONCLUSION

In view of the foregoing, Appellant respectfully requests that the Board reverse the rejections of record, and direct the Examiner to allow all of the pending claims, and to otherwise find the application to be in condition for allowance.

Respectfully submitted,

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APPENDIX

CLAIMS ON APPEAL

1. A lighting system provided with a light-emitting panel comprising

a front wall, a rear wall situated opposite thereto, and furthermore, between the front and the rear wall, a first edge surface and, opposite thereto, a second edge surface,

the first edge surface being light-transmitting,

while at least a first light source is associated with the first edge surface, and

while, in operation, light originating from the first light source is incident on the first edge surface and distributes itself in the panel,

wherein the light-emitting panel widens over a widening section from the first edge surface in a direction towards the second edge surface, and

wherein the rear wall is provided over the widening section with a multiplicity of steps of which a surface facing the front wall is substantially parallel to the front wall, and

wherein the surface of the second edge surface is specularly or diffusely reflecting or is provided with a specularly or diffusely reflecting material.

2. A lighting system as claimed in claim 1, wherein the ratio of the surface area S_1 of the first edge surface and the largest cross section S_{1cs} in the light-emitting panel substantially parallel to the first edge surface satisfies the relation:

$$1 < \frac{S_{lcs}}{S_l} < 10 .$$

3. A lighting system as claimed in claim 2, wherein the ratio S_{lcs}/S_l satisfies the relation:

$$1.5 < \frac{S_{lcs}}{S_l} < 3 .$$

7. A lighting system as claimed in claim 1, wherein a further surface of the steps makes an angle β with respect to a normal on the front wall, wherein $-48 \leq \beta \leq 48°$.

8. A lighting system as claimed in claim 7, wherein the angle β is in the range $0 \leq \beta \leq 48°$.

9. A lighting system as claimed in claim 1, wherein the front wall is provided with a translucent diffuser.

13. A lighting system as claimed in claim 1, wherein the light source comprises one white LED or at least two light-emitting diodes with different light emission wavelengths.

14. A lighting system as claimed in claim 13, wherein each of the light-emitting diodes has a luminous flux of at least 5 lm.

15. A display device provided with a lighting system as claimed in claim 1.

16. A display device as claimed in claim 13, which display device comprises a liquid crystal display.

EVIDENCE APPENDIX

EXHIBIT (3/3 sheets attached)

This EXHIBIT is a copy of a webpage which is cited on page 6 of Appellant's Brief.

While the citation and copy of the webpage were not previously provided to the Examiner, nevertheless the information provided in the EXHIBIT is freely available public information and may be useful in the disposition of this appeal, and it is urged that the EXHIBIT be entered and considered on its merits.

RELATED PROCEEDINGS APPENDIX

(none)

EXHIBIT

Reflection (physics)

From Wikipedia, the free encyclopedia

Reflection is the change in direction of a wave front at an interface between two dissimilar media so that the wave front returns into the medium from which it originated. Common examples include the reflection of light, sound and water waves.

Reflection of light may be *specular* (that is, mirror-like) or *diffuse* (that is, not retaining the image, only the energy) depending on the nature of the interface. Whether the interfaces consists of dielectric-conductor or dielectric-dielectric, the phase of the reflected wave may or may not be inverted.

The reflection of a bridge in Indianapolis, Indiana's Central Canal.

Contents

Spheres reflecting the floor and each other.

Specular (mirror-like) reflection

A mirror provides the most common model for specular light reflection and consists of a glass sheet in front of a metallic coating where the reflection actually occurs. It is also possible for reflection to occur from the surface of transparent media, such as water or glass.

In the diagram, a light ray **PO** strikes a vertical mirror at point **O**, and the reflected ray is **OQ**. By projecting an imaginary line through point **O** perpendicular to the mirror, known as the *normal*, we can measure the *angle of incidence*, θ_i and the *angle of reflection*, θ_r. The *law of reflection* states that $\theta_i = \theta_r$, or in other words, the angle of incidence equals the angle of reflection.

$\theta_i = \theta_r$.
the angle of incidence equals the angle of reflection

A Black triggerfish reflecting in the water surface.

In fact, reflection of light may occur whenever light travels from a medium of a given refractive index into a medium with a different refractive index. In the most general case, a certain fraction of the light is reflected from the interface, and the remainder is refracted. Solving Maxwell's equations for a light ray striking a boundary allows the derivation of the Fresnel equations, which can be used to predict how much of the light is reflected, and how much is refracted in a given situation. Total internal reflection of light from a denser medium occurs if the angle of incidence is above the critical angle.

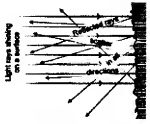
When light reflects off a material denser (with higher refractive index) than the external medium, it undergoes a 180° phase reversal. In contrast, a less dense, lower refractive index material will reflect light in phase. This is an important principle in the field of thin-film optics.

Specular reflection at a curved surface forms an image which may be magnified or demagnified; curved mirrors have optical power. Such mirrors may have surfaces that are spherical or parabolic.

Other types of reflection

Diffuse reflection

When light strikes a rough or granular surface, it bounces off in all directions due to the microscopic irregularities of the interface. Thus, an image is not formed. This is called *diffuse reflection*. The exact form of the reflection depends on the structure of the surface. One common model for diffuse reflection is Lambertian reflectance, in which the light is reflected with equal luminance (in photometry) or radiance (in radiometry) in all directions, as defined by Lambert's cosine law.



Diffuse reflection

Retroreflection

Some surfaces exhibit *retroreflection*. The structure of these surfaces is such that light is returned in the direction from which it came. A simple retroreflector can be made by placing three ordinary mirrors mutually perpendicular to one another (a corner reflector). The image produced is the inverse of one produced by a single mirror.

A surface can be made partially retroreflective by depositing a layer of tiny refractive spheres on it or by creating small pyramid like structures (cube corner reflection). In both cases internal reflection causes the light to be reflected back to where it originated. This is used to make traffic signs and automobile license plates reflect light mostly back in the direction from which it came. In this application perfect retroreflection is not desired, since the light would then be directed back into the headlights of an oncoming car rather than to the driver's eyes.

Working principle of a corner reflector

Complex conjugate reflection

Light bounces exactly back in the direction from which it came due to a nonlinear optical process. In this type of reflection, not only the direction of the light is reversed, but the actual wavefronts are reversed as well. A conjugate reflector can be used to remove aberrations from a beam by reflecting it and then passing the reflection through the aberrating optics a second time.

Neutron reflection

Materials that reflect neutrons, for example beryllium, are used in nuclear reactors and nuclear weapons.

Sound reflection

When a longitudinal sound wave strikes a flat surface, sound is reflected in a coherent manner provided that the dimension of the reflective surface is large compared to the wavelength of the sound. In the theory of exterior noise mitigation, this phenomenon mildly detracts from the concept of a noise barrier by reflecting some of the sound into the opposite direction.

Quantum Interpretation

All interactions between light photons and matter are described as a series of absorption and emission of photons. If one examines a single molecule at the surface of a material, an arriving photon will be absorbed and almost immediately reemitted. The 'new' photon may be emitted in any direction, thus causing diffuse reflection.

The specular reflection (following Hero's equi-angular reflection law) is a quantum mechanical effect explained as the sum of the most likely paths the photons will have taken. Light-matter interaction is a topic in Quantum Electrodynamics, and is described in detail by Richard Feynman in his book *QED: The Strange Theory of Light and Matter*.

As the photon absorbed by the molecule may match energetic levels of the molecule (Kinetic, Rotational, Electronic or Vibrational), the photon may not be reemitted or alternatively may lose some of its energy in the process. The emitted photon will have a slightly different level of energy. These effects are known as Raman, Brillouin and Compton scattering.

See also

- Diffraction
- Reflectivity
- Refraction
- Ripple tank for a picture and description of water waves reflecting off a boundary.
- Snell's law
- Echo satellite
- Anti-reflective coating
- Huygens-Fresnel principle

External links

- Java explanatory animation-close relation to refraction (http://www.phy.ntnu.edu.tw/ntnujava/viewtopic.php?t=32)

Retrieved from "http://en.wikipedia.org/wiki/Reflection_%28physics%29"

Categories: Geometrical optics | Physical optics